

Sean Marshall

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Education [Cornell University](#), Ithaca, NY August 2011 to October 2017
M.S., Astronomy January 2015 conferral
Ph.D., [Astronomy](#) October 2017
Committee: [Donald Campbell](#), [Philip Nicholson](#), [Joseph Burns](#), [James Cordes](#)

[Arizona State University](#), Tempe, AZ August 2006 to December 2010
B.S., [Physics](#) December 2010
B.S., [Earth and Space Exploration](#) (astrophysics) December 2010
Senior honors thesis: Optics Considerations and Design for the [Rapid Reconnaissance and Response \(R³\) Nanosat](#) (primary adviser: [Philip Christensen](#))

Research Florida Space Institute, University of Central Florida, Orlando, FL
Research assistant professor August 2023 to present

- Determining asteroids' shapes and rotation states from observational data
- Applying machine learning techniques to automate shape and thermal modeling

[Arecibo Observatory](#), Arecibo, PR
Observatory scientist in planetary radar group June 2020 to August 2023
Postdoctoral research scientist in planetary radar group November 2017 to June 2020

- Observing near-Earth asteroids (NEAs) with radar
- Determining asteroids' shapes and rotation states from observational data
- Automating observation planning and data processing

[NASA Frontier Development Lab](#), at [SETI Institute](#), Mountain View, CA
Researcher in asteroid shape modeling group June to August 2017

- Applying machine learning techniques to automate shape modeling

[Cornell University](#), Ithaca, NY
Graduate student research May 2012 to October 2017

- Combining radar and infrared observations of near-Earth asteroids
- Determining asteroids' shapes and rotation states from radar and lightcurve data
- Determining asteroids' thermal and physical properties

Advisor: [Donald Campbell](#)

Collaborators: [Jenna Crowell](#), [Yanga Fernández](#), [Ellen Howell](#), [Christopher Magri](#),
[Michael Nolan](#), [Patrick Taylor](#), [Ronald Vervack](#)

[Arizona State University](#), Tempe, AZ
Undergraduate student research November 2006 to December 2010

- Analysis of infrared observations of Mars from the Thermal Emission Imaging System ([THEMIS](#)) on NASA's 2001 Mars Odyssey spacecraft
- Programming for [Davinci](#) spectral analysis software

NASA Space Grant internships September 2007 to May 2010
Advisor: [Philip Christensen](#)

Observing Experience

Arecibo 305-meter radio telescope: [radar](#) observations of asteroids, comets, and planets
NASA IRTF 3-meter telescope: infrared observations of asteroids with [SpeX](#)

Programming Experience

Proficient with Python, Perl, and Linux shell scripts
Moderate experience with IDL, MATLAB, Gnuplot, HTML, CSS, and JavaScript

Teaching

Advised four undergraduate summer students at Arecibo Observatory, through REU and ENCANTO programs:
Riley McGlasson (Macalester College), shape modeling of asteroid 1981 Midas; [presented at AAS meeting](#) in January 2019; [published in Planetary Science Journal](#)
Daniel Repp (Western Washington University), shape modeling of asteroid 2015 DP155; [presented at LPSC](#) in March 2020
Reese Williams (Lander University), shape modeling of asteroid 68950 (2002 QF15); [presented at 89th Annual Meeting of the Southeastern Section of the APS](#) in November 2022
Valery Medina (University of Puerto Rico at Humacao), shape modeling of asteroid 1036 Ganymed; [presented at DPS-EPSC joint meeting](#) in October 2023

Gave lectures about asteroid radar observations: for Union College [physics colloquium](#) (May 2015), to AP Physics classes at Ithaca High School (June 2015), to REU students at Cornell University (June 2015), for Arecibo Observatory colloquium (February 2018), for a [geology seminar](#) at the University of Puerto Rico at Mayagüez (March 2018), to Arecibo Observatory summer students (June 2018, July 2019, June 2023), at Arecibo Observatory's public observing nights (June 2018 and June 2022), at the Green Bank & Arecibo single dish summer school (August 2019 and May 2022), to Arecibo Observatory STAR Academy high school students (November 2019, January 2022, and April 2023), for Macalester College guest lecture (March 2020), for Webster University guest lecture (March 2021), for high school astronomy class (December 2023), and for University of Central Florida seminars (March 2021 and January 2024)

Teaching Assistant, Cornell University August 2012 to May 2013
[The Nature of the Universe](#), Fall 2012, Yervant Terzian and Terry Herter
[Our Solar System](#), Spring 2013, Joseph Burns and Steven Squyres

Public Outreach

Managed Cornell's "[Ask an Astronomer](#)" website September 2012 to June 2017
Helped with astronomy activities for many public outreach events while at Cornell, including [Bring a Child to Work Day](#), [Expanding Your Horizons](#), [Focus for Teens](#), [Kids' Science Day](#), [Museum in the Dark](#), [Reddit Ask Us Anything](#), solar eclipse viewing, and astronomy department open houses

Organizations

[American Astronomical Society](#)
[Division for Planetary Sciences](#)
Member of science team for JAXA's upcoming [DESTINY+ mission](#) to 3200 Phaethon

Awards	Eleanor York Prize	May 2017
	NASA Earth and Space Science Fellowship	August 2015 to May 2017
	Cornell University: Graduate Fellowship	August 2011 to May 2012
	Arizona State University: graduated Summa Cum Laude	December 2010
	Arizona State University: National Merit Scholarship	August 2006 to May 2010

Currently Funded Grants

- Arecibo Observatory Planetary Radar Program (originally as a postdoc, NASA [80NSSC19K0523](#))
- Applying Bayesian Optimization to Thermophysical Modeling of Asteroids (principal investigator, NASA [80NSSC23K0377](#))
- Arecibo planetary radar physical and dynamical characterization of NEAs (co-investigator, accepted under NASA YORPD 2022, grant number pending)

Publications

- F.C.F. Venditti, **S.E. Marshall**, M. Devogèle, L.F. Zambrano-Marin, A. McGilvray. [The Arecibo Observatory's legacy and future radar capabilities](#). *Acta Astronautica*, vol. 210, 610-615, 2023.
- S.A. Myers, E.S. Howell, C. Magri, R.J. Vervack, Y.R. Fernández, **S.E. Marshall**, P.A. Taylor. [Constraining the Limitations of NEATM-like Models: A Case Study with Near-Earth Asteroid \(285263\) 1998 QE2](#). *Planetary Science Journal*, vol. 4, issue 1, id. 5, 2023.
- E. MacLennan, **S. Marshall**, M. Granvik. [Evidence of surface heterogeneity on active asteroid \(3200\) Phaethon](#). *Icarus*, vol. 388, id. 115226, 2022.
- A.K. Virkki, **S.E. Marshall**, F.C.F. Venditti, L.F. Zambrano-Marín, D.C. Hickson, A. McGilvray, P.A. Taylor, E.G. Rivera-Valentín, M. Devogèle, E. Franco Díaz, S.S. Bhiravarasu, B. Aponte Hernández, C. Rodríguez Sánchez-Vahamonde, M.C. Nolan, P. Perillat, I. Cabrera, E. González, D. Padilla, V. Negrón, J. Marrero, J. Lebrón, A. Bagué, F. Jiménez, A. López-Oquendo, D. Repp, R.A. McGlasson, B. Presler-Marshall, E.S. Howell, J.-L. Margot, S. Prabhu Desai. [Arecibo Planetary Radar Observations of Near-Earth Asteroids: 2017 December-2019 December](#). *Planetary Science Journal*, vol. 3, issue 9, id. 222, 2022.
- M.L. Hinkle, E.S. Howell, Y.R. Fernández, C. Magri, R.J. Vervack Jr., **S.E. Marshall**, J.L. Crowell, A.S. Rivkin. [The global thermophysical properties of \(433\) Eros](#). *Icarus*, vol. 382, id. 114939, 2022.
- L.F. Zambrano-Marin, E.S. Howell, P.A. Taylor, **S.E. Marshall**, M. Devogèle, A.K. Virkki, D.C. Hickson, E.G. Rivera-Valentín, F.C.F. Venditti, and J.D. Giorgini. [Radar and Optical Characterization of Near-Earth Asteroid 2019 OK](#). *Planetary Science Journal*, vol. 3, issue 6, id. 138, 2022.
- V. Reddy, M.S. Kelley, J. Dotson, R.R. Landis, L.E. McGraw, M. Micheli, N.A. Moskovitz, J.A. Sanchez, P.A. Taylor, L. Wheeler, J.M. Bauer, M.J. Brucker, M. Devogèle, J.P. Emery, O. Hainaut, D.C. Hickson, D. Koschny, J.A. Larsen, **S.E. Marshall**, R. McMillan, B.A. Skiff, F.C.F. Venditti, A.K. Virkki, B. Yang, L.F. Zambrano-Marin. [Near-earth asteroid \(66391\) Moshup \(1999 KW4\) observing campaign: Results from a global planetary defense characterization exercise](#). *Icarus*, vol. 374, id. 114790, 2022.
- R.A. McGlasson, **S.E. Marshall**, F.C.F. Venditti, S.P. Naidu, L.A.M. Benner, M. Brozović, J.D. Giorgini, P.A. Taylor, B. Aponte, A.K. Virkki, A.W. Harris, J.W. Young, M. Husárik, G. Wells, D. Bamberger, J. Tobak. [Radar and Lightcurve Observations and a Physical Model of Potentially](#)

- [Hazardous Asteroid 1981 Midas](#). *Planetary Science Journal*, vol. 3, issue 2, id. 35, 2022.
- C.D. Lewin, E.S. Howell, R.J. Vervack Jr., Y.R. Fernández, C. Magri, **S.E. Marshall**, J.L. Crowell, M.L. Hinkle. [Near-infrared Spectral Characterization of Solar-type Stars in the Northern Hemisphere](#). *Astronomical Journal*, vol. 160, issue 3, id.130, 2020.
- P.A. Taylor, E.G. Rivera-Valentín, L.A.M. Benner, **S.E. Marshall**, A.K. Virkki, F.C.F. Venditti, L.F. Zambrano-Marin, S.S. Bhiravarasu, B. Aponte-Hernandez, C. Rodriguez Sanchez-Vahamonde, J.D. Giorgini. [Arecibo radar observations of near-Earth asteroid \(3200\) Phaethon during the 2017 apparition](#). *Planetary and Space Science*, vol. 167, 1-8, 2019.
- S.S. Bhiravarasu, E.G. Rivera-Valentín, P.A. Taylor, L.F. Zambrano-Marin, B. Aponte-Hernandez, **S.E. Marshall**. [Arecibo Radar Observations of Dwarf Planet 1 Ceres During the 2018 Apparition](#). *Research Notes of the American Astronomical Society*, vol. 2, issue 4, id.#232, 2018.
- C. Magri, E.S. Howell, R.J. Vervack, Jr., M.C. Nolan, Y.R. Fernández, **S.E. Marshall**, and J.L. Crowell. [SHERMAN, a shape-based thermophysical model: I. Model description and validation](#). *Icarus* 303, 203-219, 2018.
- E.S. Howell, R.J. Vervack, Jr., C. Magri, M.C. Nolan, P.A. Taylor, Y.R. Fernández, M.D. Hicks, J.M. Somers, K.J. Lawrence, A.S. Rivkin, **S.E. Marshall**, and J.L. Crowell. [SHERMAN, a shape-based thermophysical model: II. Application to \(8567\) 1996 HW1](#). *Icarus* 303, 220-233, 2018.
- S.E. Marshall**, E.S. Howell, C. Magri, R.J. Vervack, Jr., D.B. Campbell, Y.R. Fernández, M.C. Nolan, J.L. Crowell, M.D. Hicks, K.J. Lawrence, and P.A. Taylor. [Thermal Properties and an Improved Shape Model for Near-Earth Asteroid \(162421\) 2000 ET70 \(preprint\)](#). *Icarus* 292, 22-35, 2017.
- J.L. Crowell, E.S. Howell, C. Magri, M.C. Nolan, Y.R. Fernandez, J.E. Richardson, B.D. Warner, **S.E. Marshall**, A. Springmann, and R.J. Vervack, Jr. [Radar and Lightcurve Shape Model of Near-Earth Asteroid \(1627\) Ivar](#). *Icarus* 291, 254-267, 2017.

First-Author Conference Presentations

- S.E. Marshall**, M. Devogele, F. Venditti, L. Zambrano-Marin. [Capabilities of Ground-Based Radar Systems for Observations of Near-Earth Objects](#). American Astronomical Society, Division for Planetary Sciences meeting #55, id. 405.13, 2023.
- S.E. Marshall**, L.F. Zambrano-Marin, M. Devogèle, F.C.F. Venditti, P.A. Taylor, C. Magri, E.M. MacLennan. [Arecibo Observatory Asteroid Projects](#). Asteroids, Comets, Meteors, id. #2563, 2023.
- S.E. Marshall**, E.M. MacLennan, C. Magri, Y.R. Fernandez, E.S. Howell, K.D. McFadden, S.A. Myers, R.J. Vervack Jr. [Applying Bayesian Optimization to Thermophysical Modeling of Asteroids](#). Thermal Models for Planetary Science IV, 2023.
- S.E. Marshall**, M. Devogèle, F.C.F. Venditti, L.F. Zambrano-Marin, A. McGilvray, M. Ferrais. [Capabilities of Past, Present, and Future Radar Systems for Observations of Near-Earth Objects](#). 8th IAA Planetary Defense Conference, id. IAA-PDC-23-02-91, 2023.
- S. Marshall**, M. Devogele, P. Taylor, C. Magri, J. Beniyama, T. Sekiguchi, D. Kuroda, S. Urakawa, F. Yoshida, T. Arai, B. Warner, P. Pravec, H. Kučáková, K. Hornoch, P. Kušnirák, J. Hanuš, M. Ferrais, E. Jehin, E. Kuznetsov, D. Glamazda, G. Kaiser, A. Shagabudinov, Y. Vibe, A. Serebryanskiy, M. Krugov, I. Reva, M.-J. Kim, D.-H. Kim. [The changing rotation period of 3200 Phaethon](#). American Astronomical Society, Division for Planetary Sciences meeting #54, id.

514.07, 2022.

- S. Marshall**, R. McGlasson, D. Repp, P. Taylor, L. Benner, M. Brozovic, S. Naidu, F. Venditti, E. Rivera-Valentín. [Shape Models of Near-Earth Asteroids from Arecibo and Goldstone Radar Data](#). American Astronomical Society, Division for Planetary Sciences meeting #53, id. 306.12, 2021.
- S.E. Marshall**, P.A. Taylor, E.G. Rivera-Valentin, F.C.F. Venditti, A.K. Virkki, L.A.M. Benner, M. Brozovic, S.P. Naidu, L.F. Zambrano-Marin, S.S. Bhiravarasu, B. Aponte-Hernandez, C.R. Sanchez-Vahamonde. [Shape model of 3200 Phaethon from radar, lightcurve, and occultation observations](#). 7th IAA Planetary Defense Conference, id. 231, 2021.
- S.E. Marshall**. [Analysis of asteroid lightcurves' error bars](#). American Astronomical Society, Division for Planetary Sciences meeting #52, id. 409.04, 2020.
- S.E. Marshall**, P. Taylor, E. Rivera-Valentín, F. Venditti, A. Virkki, L. Benner, M. Brozović, S. Naidu, L. Zambrano-Marin, S. Bhiravarasu, B. Aponte-Hernandez, C. Rodriguez Sanchez-Vahamonde. [Shape model of 3200 Phaethon from radar and lightcurve observations](#). EPSC-DPS Joint Meeting, id.#EPSC-DPS2019-1246, 2019.
- S.E. Marshall**, A. Cobb, C. Raïssi, Y. Gal, A. Rozek, M.W. Busch, G. Young, R. McGlasson. [Using Bayesian Optimization to Find Asteroids' Pole Directions](#). American Astronomical Society, Division for Planetary Sciences meeting #50, id.#505.01D, 2018.
- S.E. Marshall**, E.S. Howell, R.J. Vervack, Jr., C. Magri, J.L. Crowell, Y.R. Fernandez, D.B. Campbell, M.C. Nolan, V. Reddy, B. Bozek. [Thermophysical Modeling of Potentially Hazardous Asteroid \(85989\) 1999 JD6](#). American Astronomical Society, Division for Planetary Sciences meeting #49, id.#110.15, 2017.
- S.E. Marshall**, D.B. Campbell, C. Magri, M. Brozović, P.A. Taylor, R.J. Vervack Jr., J.L. Crowell, Y.R. Fernández, L.A.M. Benner, S.P. Naidu, J.D. Giorgini, J.S. Jao, C.G. Lee, J.E. Richardson, L.A. Rodriguez-Ford, F. Ghigo, A. Kobelski, M.W. Busch, P. Pravec, B. Sharkey, E.S. Howell, M.C. Nolan, M.D. Hicks, B. Bozek, A. Aznar, B.-O. Demory, R. Behrend. [Shape Modeling of Potentially Hazardous Asteroid \(85989\) 1999 JD6 from Radar and Lightcurve Data](#). Asteroids, Comets, Meteors 2017.
- S.E. Marshall**, E.S. Howell, C. Magri, D.B. Campbell, M.C. Nolan, Y.R. Fernandez, R.J. Vervack, Jr., J.L. Crowell, M.D. Hicks, K.J. Lawrence, and P.A. Taylor. [Thermal Properties and a Revised Shape Model for Near-Earth Asteroid \(162421\) 2000 ET70](#). American Astronomical Society, Division for Planetary Sciences meeting #48, id.#516.06, 2016.
- S.E. Marshall**, E.S. Howell, M. Brozović, P.A. Taylor, D.B. Campbell, L.A.M. Benner, S.P. Naidu, J.D. Giorgini, J.S. Jao, C.G. Lee, J.E. Richardson, L.A. Rodriguez-Ford, E.G. Rivera-Valentin, F. Ghigo, A. Kobelski, M.W. Busch, P. Pravec, B.D. Warner, V. Reddy, M.D. Hicks, J.L. Crowell, Y.R. Fernandez, R.J. Vervack, M.C. Nolan, C. Magri, B. Sharkey, and B. Bozek. [Potentially Hazardous Asteroid \(85989\) 1999 JD6: Radar, Infrared, and Lightcurve Observations and a Preliminary Shape Model](#). American Astronomical Society, Division for Planetary Sciences meeting #47, id.#204.09, 2015.
- S.E. Marshall**, E.S. Howell, C. Magri, R.J. Vervack, Y.R. Fernandez, D.B. Campbell, M.C. Nolan, P.A. Taylor, J.T. Pollock, and M.D. Hicks. [Thermal Modeling of Three Non-Spherical Near-Earth Asteroids](#). 46th Lunar and Planetary Science Conference, LPI Contribution No. 1832, p.2995, 2015.
- S. Marshall**, R.J. Vervack, C. Magri, E.S. Howell, Y.R. Fernandez, D.B. Campbell, M.C. Nolan, P.A. Taylor, J.T. Pollock, and M.D. Hicks. [Shape-Based Thermal Modeling of Three Near-Earth](#)

[Asteroids](#). American Astronomical Society, Division for Planetary Sciences meeting #46, id.#509.06, 2014.

S. Marshall, E. Howell, M. Nolan, C. Magri, D. Campbell, L. Benner, P. Taylor, A. Springmann, P. Brown, P. Pravec, Y. Fernandez, R. Vervack, Jr., M. Brozović, M. Busch, J. Giorgini, S. Ostro. [Near-Earth asteroid \(137032\) 1998 UO1: Shape model and thermal properties](#). Asteroids, Comets, Meteors 2014.

S. Marshall, E.S. Howell, C. Magri, R.J. Vervack, Y.R. Fernandez, M.C. Nolan, P.A. Taylor, A. Springmann. [Application of a Shape-Based Thermophysical Model to Contact Binary Near-Earth Asteroids](#). American Astronomical Society, Division for Planetary Sciences meeting #45, id.#208.17, 2013.

S. Marshall, E.L. Wright. [Observations of Near-Earth Asteroid 2010 CN141 with the Wide-field Infrared Survey Explorer](#). American Astronomical Society, AAS meeting #217, id.#333.02, 2011.

S. Marshall, J. Williams, T. Mazeh, G. Walker, V. Strel'nitski. [Using Sys-Rem as an Alternative Photometry Technique](#). American Astronomical Society, AAS meeting #215, id.#438.11, 2010.

References	Dr. Donald B. Campbell (dissertation advisor) Cornell University 510 Space Sciences Building, Ithaca, NY 14853	607-255-9580 campbell@astro.cornell.edu
	Dr. Ellen S. Howell University of Arizona 1629 E University Blvd, Tucson, AZ 85721-0092	520-626-2880 ehowell@orex.lpl.arizona.edu
	Dr. Patrick A. Taylor National Radio Astronomy Observatory 1180 Boxwood Estate Rd, Charlottesville, VA 22903	434-296-0289 ptaylor@nrao.edu